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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/670,955
Filing Date: September 25, 2003
Appellant(s): COLBERT ET AL.

Ross Spencer Garson
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 7/5/2007 appealing from the Office action mailed 9/11/2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows:

WITHDRAWN REJECTIONS

The following grounds of rejection are not presented for review on appeal because they have been withdrawn by the examiner. The 35 U.S.C. 112 first paragraph rejections over claims 94 and 95 are hereby withdrawn.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5698175 Hiura 12-1997

Iijima, "Single-shell carbon nanotubes of 1-nm diameter" Nature, vol363, (June 1993), pp. 603-605

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 84-85, 91-92, and 94-95 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hiura (US 5698175) in view of Iijima (Nature, Vol 363, June 1993).

Hiura discloses a method for producing end-derivatized carbon nanotubes comprising the steps of: a) providing a plurality of carbon nanotubes with at least about 100 carbon atoms; and b) reacting the carbon nanotubes with a compound that provides at least one substituent on at least one of the ends of least a portion of the carbon nanotubes (Abstract). At least one substituent is selected from the group consisting of alkyl; acyl; aryl; aralkyl; halogen; substituted thiol; unsubstituted thiol; substituted amino; unsubstituted amino; hydroxyl (Column 3). The derivatized carbon nanotubes are inherently soluble in some medium.

Hiura does not expressly state that the carbon nanotubes are single-wall carbon nanotubes.

Iijima discloses a method of producing single-walled carbon nanotubes (Paragraph 2). Hiura and Iijima are analogous art because they are from the same field of endeavor, namely processes involving carbon nanotubes.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to form the process of Hiura to include the use of Single walled carbon nanotubes in view of the teaching of Iijima. The suggestion or motivation of doing so would have been to derivatize single-walled carbon nanotubes.

(10) Response to Argument

Appellants argue that "not only would the teaching of Hiura when combined with the teachings of Iijima not have suggested a reasonable likelihood of success as applied to single-wall carbon nanotubes, such a chemical protocol would fail to achieve the desired results". To support this argument appellants recite "Hiura primarily teaches the purification of multi-wall carbon nanotubes. Such purification is carried out by reacting such nanotubes with highly oxidative acids and/or oxidation agents under reflux and/or ultrasonic conditions. Such purification damages the multi-wall structures, as shown graphically in Hiura (Fig. 3). Application of the teachings of Hiura to multi-wall carbon nanotubes, typically riddled with defects, results in the breaking of carbon-carbon bonds generally at regions of defects on the walls as well as the ends. See Hiura at Figure 3. However, because of their multi-wall structure, the multi-wall nanotubes can withstand attack to their wall layers and still remain intact. As will be appreciated by one of skill in the art, such bond splitting with single-wall carbon

nanotubes would be expected to result in destruction of the single-wall nanotubes". However this argument is not persuasive because the instant process is also carried out by reacting nanotubes with highly oxidative acids and/or oxidation agents under reflux conditions. Therefore, it appears that the process of Hiura in view of Iijima and the instantly claimed process would produce similar results.

Appellants argue that it would not have been obvious to a person of ordinary skill in the art to combine Hiura and Iijima to successfully obtain the claimed invention. The appellants site "gas-phase oxidation, which yields purified multishell nanotubes, destroys the single-shell nanotubes before anything else in the sample" found in "Purification of Single-Shell Nanotubes," Adv. Mater., 10 No. 8, 611-613 (1998) ("Dujardin") in support of this argument. However, gas-phase oxidation is not taught by the process of Hiura, therefore the teaching of Dujardin does not sufficiently render the combination of Hiura and Iijima nonobvious.

Appellants argue that "a person of ordinary skill in the art would have reasonably believed the Hiura process would destroy the single-wall carbon nanotubes, which, in fact, was a view that was widely held by those skilled in the art well after the publication dates of Hiura and Iijima, as confirmed by Dujardin et al., "Purification of Single-Shell Nanotubes," *Adv. Mater.*, 10, N0. 8, 611-613 (1998)" in the appeal brief.

Appellants' reliance on Dujardin is inapposite. Post-filing date references have no legal relevance to the novelty or obviousness analysis. *See* 35 U.S.C. §§ 102-103. The fact that Dujardin and coworkers -- with the *benefit* of approximately *three years* of further study, reflection and hindsight from the work disclosed in US 5,698,175 to Hiura

-- et al. made some statement in an article published two years after the priority date of the instant application should not influence the Board. The Board should concern itself with the art of record that qualifies under 35 U.S.C. §102 *only*.

The prior art of record is a clear demonstration of a situation where "there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp" *KSR Intl. v. Teleflex, Inc.*, 550 U.S. -- 82 USPQ2d 1385, 1397 (2007). As applied to the instant case, single-walled nanotubes were clearly within the technical grasp of one of ordinary skill in the art. Any argument that one of ordinary skill in the art at the time of invention (e.g. "Hidefumi Hiura") would not be cognizant of single-walled carbon nanotubes and the design incentives present to derivatize them is greatly diminished with the facts of record. The fact that Hiura discloses the broader "genus" of "nanotubes" (i.e. by not differentiating between single-walled and multi-walled nanotubes) should not lead the board to a conclusion that one of ordinary skill in the art was not aware of single-walled nanotubes, or that derivatizing a single-walled nanotube was non-obvious. The Board should take note that Hiura and Ebbsen (the named inventors of US 5,698,175) both work for the NEC Corporation with Sumio Iijima and Toshinari Ichihashi, authors of the "Iijima article." Clearly, single-wall and multi-wall nanotubes were well within the technical grasp of one of ordinary skill in the art at the time of invention. In fact, Iijima -- two years *before* Hiura -- states "the synthesis of *abundant* single-shell tubes with diameters of about one nanometer" is possible. *Iijima* at 603 (Col. 1, emphasis added). Therefore, at the time of invention it

would have been obvious to one of ordinary skill in the art to execute the process of Hiura using single-walled carbon nanotubes.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Examiner James Fiorito

JF

Conferees:

Stanley Silverman

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